

## EXTRACT OF PLANT *DENDROBII CAULIS* AND PREPARING PROCESS THEREOF

### FIELD OF THE INVENTION

[0001] This invention relates to a process for preparing an extract from a plant and the extract thereof, and especially to one process of using a water miscible organic solvent or a mixture thereof with water for obtaining an extract from the plant.

### BACKGROUND OF THE INVENTION

[0002] Nowadays, the *Dendrobium* species is considered to be the most precious Chinese herb for treating ophthalmic defects. A *Dendrobium* species belongs to an orchid family, and its stem is the mainly medicinal part. It tastes a little sweet and brackish. Some Chinese medical codices disclose that the *Dendrobium* species is the curative for some illnesses such as salivary defects, stomach defects, and ophthalmic defects. According to our previous research experience, it appears that the *Dendrobii Caulis* is the most medicinal species.

[0003] A retinal pigment epithelium (RPE) is a monolayer cell at the surface layer of the retina, which is located between the Bruch's membrane and the photoreceptors. The villous processes at the top of RPE are connected to the outer segments of the photoreceptors, and the basal infoldings at the bottom of RPE are connected to the choroids via the Bruch's membrane. Since the RPE can effectively remove or transmit the toxic materials and the metabolite of the choroid coat and the retina, it performs a very important blood-retinal barrier. In addition, the RPE has many functions, such as receiving light, phagocytizing the outer segments separated from the rod cell

and the cone cell because of light stimulation, catabolizing the phagosome, synthesizing the extracellular matrix and the melanin, detoxifying the medicine, providing the essential material for reproducing the outer segments of the photoreceptor, storing and transmitting the Vitamin A, synthesizing the rhodospin, and forming the adherent force of the retina. According to the statistics, a RPE of rat can remove 25000 outer segments separated from the rod cells and the cone cells because of light stimulation in one day, which obviously shows the importance of the frequent phagocytic metabolism (Mayerson and Hall, 1986). The normal phagocytosis of the RPE plays a critical role in maintaining the health of the photoreceptors in the retina. Once the function of phagocytosis is reduced, it will result in the degeneration of the photoreceptors. Although the RPE will be dead or moved to someplace else with the increasing age, the aged RPE still owns the phagocytic ability. However, the digestion ability of the RPE is obviously reduced (Boulton and Marshall, 1986). It appears that the numbers of the human photoreceptors will be decreased per year with a rate ranged from 0.2 to 0.4 % per year (Panda-Jonas *et al.*, 1995). Further, the lost quantity of the rod cells are more than those of the cone cells, which causes the diseases and the vision degradation of the aged people. Therefore, maintaining the RPE function is quite important for the visual system.

[0004] Although a nitric oxide (NO) is a small, unstable gas molecule with a half-life of several seconds, it has various kinds of physiological functions. Since the NO is an electrically neutral gas, it can arbitrarily penetrate the cell wall. On the other hand, since the NO has the unpaired electron, the NO molecule is highly reactive as the free radicals so that it will penetrate the cell membrane and react immediately after being formed. In the

immune system, the NO plays a defensive role and is toxic to cells. In the blood vessel system, the NO is a so-called endothelium derived relaxing factor (EDRF). And, in the central nervous system, the NO acts as a neurotransmitter.

[0005] The NO is released from the process of transferring L-arginine into L-citrulline via a nitric oxide synthase (NOS). However, the detailed transferring mechanism of how to release the NO is still unclear till now. The NOS includes three kinds of isoforms, a neuronal NOS, an endothelial NOS and an immunologic NOS. The neuronal NOS and the endothelial NOS are constitutive forms, named as cNOS, whose activities are regulated by the calcium ion ( $\text{Ca}^{++}$ ) and the calmodulin, and the concentration of the released NO is in the level of nano-molarity (nM). The immunologic NOS is an inducible form, named as iNOS, whose activity is not regulated by the  $\text{Ca}^{++}$  and the calmodulin, and the concentration of the released NO is in the level of milli-molarity (mM). The genes of the cNOS and the iNOS are respectively located on different chromosomes. Taking human beings as an example, the neuronal NOS is located on the chromosome 12, the endothelial NOS is located on the chromosome 7, and the immunologic NOS is located on the chromosome 17 (Goldstein *et al.*, 1996).

[0006] In retina, the NOS has been found in the retinal neuron, RPE, amacrine cells, ganglion cells, and Muller cells. It appears that the NO plays an important role in the physiology and pathology, and is closely related to the functions of the eye.

[0007] Because the NO can regulate the voltage-gated ion channel on the photoreceptors, it is conjectured that the NO is related to the transmission of the light messages. It's found that the NO owns the ability of regulating the

blood flow of the retina under a basal condition or an ischemia environment (Tilton *et al.*, 1993). Further, it's believed that the NO may own the ability of regulating the damage degrees of the blood vessels in the retina, in which the damage is caused by diabetes (Goureau *et al.*, 1994). In addition, when the retinal glial cells and the RPE are stimulated by the LPS, IFN- $\gamma$ , and the TNF- $\alpha$ , the NOS will be largely expressed, which largely increase the production of the NO. In other words, under the conditions that the retina is inflamed or infected, the NO might play a role in the defense and protection mechanisms.

[0008] Till now, the position and the characteristics of the cNOS in the photoreceptor are still unclear. Some references disclose that the main body of the photoreceptor has the cNOS activities, and other references disclose that only the photoreceptor outer segments own the cNOS activities. The released NO can regulate the transmission of light, the transmitted message of the neuron synapse, and the blood flow of the retina under a physiological condition or an ischemia environment. The iNOS activity can also be found in some cells in the retina, such as the RPE and the Muller cells. In the culture of a bovine RPE, after being stimulated for 12 hours with the IFN- $\gamma$ , LPS, and TNF- $\alpha$ , a mass of NO will be released for at least 96 hours. The effects of the cytokines on the RPE iNOS activity are quite complex. In a bovine RPE, for instance, being stimulated by the LPS and the IFN- $\gamma$ , or the IFN- $\alpha$  are necessary for releasing a mass of NO. The bFGF inhibits the functions of NOS, but the TGF- $\beta$  slightly enhances the functions of the NOS. For a human RPE, it is necessary to be stimulated by the Interleukin-1  $\beta$  to

release a mass of NO. However, the LPS is not the necessary factor to stimulate a human RPE. In addition, the TGF- $\beta$  obviously inhibits the release of the NO in a human RPE.

[0009] When infected by bacteria, the expressions of iNOS may be beneficial because the released NO will kill the invaded microorganism. Contrarily, in some cases, when the released NO is exceeded, the released NO will result in the autoimmune diseases or the septic shock. In 1994, the first evidence for explaining the relationship between NO and the inflammation of the fundus oculi is proposed, and the reference also proposed that the uveitis resulted from the endotoxins can be blocked by the iNOS inhibitor. On the other hand, it appears that the aFGF and the bFGF can inhibit RPE from generating a mass of NO by treating the RPE with IFN- $\gamma$  and LPS. Since it is the expression of the iNOS, but not the stabilities of the iNOS being mRNA, is inhibited, it's conjectured that the FGF will protect the RPE from being damaged by the endotoxins and the cytokines. Thus, it can be seen that the iNOS also plays a role in regulating the immunity of the retina.

[0010] The common retinal diseases include the proliferative diabetic retinopathy caused by the diabetes, the proliferative vitreoretinopathy, and the Aged-macular degeneration. However, the retinal diseases are the hardest diseases to cure in the ophthalmic defects. The hyperglycemia accelerates the glycation, which forms the advanced glycation end products (AGEs), and it is believed that the AGES closely relates to the vascular complication or the neuronal complication (Lu *et al.*, 1998). An unstable schiff base is formed via the nonenzymatic reaction between the aldehyde group or the ketone group of the reducing sugar and the primary amino acids of the protein. Then, an

amadori product is formed from the schiff base via the amadori rearrangement (Münch *et al.*, 1997). And, the advanced glycosylation end product (AGE) will be formed from the amadori product via the rearrangement process. It is known that the nonenzymatic glycosylation is not a reversible reaction and usually occurs at the protein having a long half-life. While the AGE formation results in cross-linking, the protein molecule would have a resistance to the protease. Therefore, the accumulation of the AGE would be an aging mark (Handa *et al.*, 1999). With the increasing age, the AGE amounts in the pyramidal neurons of the brain, the Bruch's membrane and the collagen will increase gradually. The reactive rate of the nonenzymatic glycosylation is a primary reaction, and the reaction rate is dependent on the concentrations of the reducing sugar and the protein. Usually, a diabetic patient has a higher blood glucose concentration than normal people, so that the glycosylation situation will be increased. It is known that the diabetic patients have higher probabilities of having some diseases or symptoms for the normal people are all directly related to the AGE, in which the disease or symptoms include the atherosclerosis, the kidney impair, the vessel damage, the neuron disease, the retinopathy, and the apoplexy (Zimmerman *et al.*, 1995). The main reason for the aggregation of the erythrocyte, resulted from the diabetes, is that the tertiary structure of the albumin is changed after being glycosylated, so that the glycosylated albumin loses the functions of the anti-aggregation. Further, the reason for changing the permeability of the glomerulus is the glycosylation of the albumin but not the glycosylation of the glomerular basement membrane. In addition, the glycosylated protein has a better ability for penetrating the blood brain barrier.

[0011] The AGE can combine with some receptors on the cell surface or some proteins. The known receptors include the scavenger receptors type I, the scavenger receptors type II, the receptor for AGE (RAGE), OST-48 (AGE-R1), 80K-H phosphoprotein (AGE-R2), and the galectin-3 (AGE-R3). Besides, the RAGE can be found at the surfaces of the monocyte, the macrophage, the endothelial cell, and the glia cell. When the cell is activated by the AGE, the expressions of the extracellular matrix protein, the vascular adhesion molecules, and the growth factors will increase. Depending on the different cell types and the transmitted signals, some phenomena will occur accompanied with the above situation, such as the chemotaxis, the angiogenesis, the oxidative stress, the cell proliferation and the programmed cell death. It appears that the various cells in the human brain are able to express different RAGEs, which remove the AGE. When the remove ability is lost, the AGE will be accumulated outside the cell, which induces the inflammation reaction of the central nervous system. Furthermore, the AGE will induce the expressions of both the retinal vascular endothelial growth factor of the RPE and the PDGF- $\beta$  (Handa *et al.*, 1998). The AGE plays an important role in the aging process, so that designing a pathological model by the glycosylated albumin for developing a new medicine is very important.

[0012] The most important growth factor in the liver is the hepatocyte growth factor/ scatter factor (HGF/SF), which is formed by combining the 60 KDa heavy chain ( $\alpha$  chain) with the 30 KDa light chain ( $\beta$  chain) through the disulfide bond. The newly formed HGF/SF is the prepro HGF/SF, which needs to be modified by an enzyme for forming the heterodimeric form before having a biological activity. The HGF is a multi-function growth

factor, which not only has the ability for regulating the growth of the various cells, but also plays an important role in the tissue repair and the organ regeneration. The internal distribution of the HGF is very extensive, wherein the liver has the highest quantity of the HGF. Furthermore, the HGF can be found in the pancreas, the thymus, the blood, the small intestines, the placenta and so forth. In addition, the HGF/SF or the HGF/SF receptors are found in the eye secretions and the eye tissues, such as the tears, the lachrymal gland, and the cornea, so that it is conjectured that the HGF may play a role in the regulation of eyes (Li *et al.*, 1996). Besides, it's known that the RPE has both the HGF and the HGF receptor (c-Met). Since the tyrosine phosphorylation of the c-Met expresses all the time, the HGF may be a growth factor with the self-stimulation function for the RPE. Further, the HGF may be related to the development of the retina (Sun *et al.*, 1999), the wound healing, and the newborn retinal vessels (He *et al.*, 1985).

[0013] From the above, it is known that RPE plays an important role in retinal regulation mechanisms. Meanwhile, we have found and proved that the Chinese herb, *Dendrobium* species, is able to enhance or inhibit some functions or regulation mechanisms in RPE. More specifically, the *Dendrobium* species can enhance the expressions of RPE phagocytosis, the NO formation of the RPE, the gene expressions of the RPE liver hepatocyte growth factor. The *Dendrobium* species can inhibit the gene expressions of the bFGF, the VEGF and the TGF- $\beta$  in the RPE under a normal condition and an ischemia environment. Consequently, the relevant researches about the enhancing factors of the RPE activities are important for improving the



health of the body. That is to say, the relevant research is absolutely worthy in the relevant industries.

[0014] Because of the technical defects described above, the applicant keeps on carving unflaggingly to develop “EXTRACT OF PLANT *DENDROBII CAULIS* AND PREPARING PROCESS THEREOF” through wholehearted experience and research.

#### SUMMARY OF THE INVENTION

[0015] It is a main object of the present invention to provide some experiment process for searching out the enhancing factors of the function or activity in the retinal pigment epithelium.

[0016] It is another object of the present invention to provide some enhancing factors of the function or activity in the retinal pigment epithelium for treating some ophthalmic defects.

[0017] It is another object of the present invention to provide some processes for testing the physiological ability of a plant extract.

[0018] It is an aspect of the present invention to provide an extract of a plant *Dendrobii Caulis*, obtained by an extraction of said plant or parts thereof with a water miscible organic solvent or a mixture thereof with water.

[0019] Preferably, the organic solvent is one selected from a group consisting of an alcohol having 1 to 8 carbon atoms, an alkane, and an ester.

[0020] In accordance with another aspect of the present invention, a physiological active composition including a physiologically acceptable carrier for carrying therewith, and one of an extract described above and an isomer of the extract is provided.

[0021] Preferably, the physiological active composition is a pharmaceutical composition.

[0022] Preferably, the physiologically acceptable carrier is a pharmaceutical carrier.

[0023] In accordance with another aspect of the present invention, a process for preparing an extract from a plant *Dendrobii Caulis*, including plural steps of extracting the plant or parts thereof with a water, a water miscible organic solvent or a mixture thereof is provided.

[0024] Preferably, the organic solvent is one selected from a group consisting of an alcohol having 1 to 8 carbon atoms, an alkane, and an ester.

[0025] In accordance with another aspect of the present invention, a process for preparing an extract from a plant is provided. The process includes steps of a) obtaining a first alcohol extract from the plant, b) extracting the first alcohol extract by a water and an alkane simultaneously for obtaining a first water layer and an alkane extract, c) extracting the first water layer by an ester for obtaining an ester extract and a second water layer, and d) extracting the second water layer by a second alcohol for obtaining a second alcohol extract and a third water layer.

[0026] Preferably, the plant belongs to Genus *Dendrobium*.

[0027] Preferably, the step a) further includes steps of a1) providing a dry material of the plant, a2) grinding the dry material by a pulverizer, and a3) extracting the ground dry material by the first alcohol for obtaining the first alcohol extract.

[0028] Preferably, the first alcohol is an alcohol having 1 to 8 carbon atoms.

[0029] Preferably, the second alcohol is an alcohol having 1 to 8 carbon atoms.

[0030] Preferably, the step b) further includes a step of b1) drying the first alcohol extract through steps of decompressing, condensing, and exhausting.

[0031] Preferably, the alkane extract is an n-hexane extract.

[0032] Preferably, the step c) further includes steps of c1) drying the ester extract, and c2) extracting the dried ester extract with a hexane and a methanol for obtaining a hexane extract and a methanol extract.

[0033] Preferably, the hexane extract is dried by steps of decompressing, condensing, and exhausting.

[0034] Preferably, the ester is an ethyl-acetate.

[0035] Preferably, the process further includes steps of e) chromatographing the second alcohol extract for obtaining a first eluate named as DCMPbL6,7, and f) chromatographing the DCMPbL6,7 by a mobile phase for obtaining a second eluate.

[0036] Preferably, the step e) is performed by an eluent of a methanol/water mixture in a 50:50 volume ratio.

[0037] Preferably, the mobile phase is an isopropanol/water mixture in a 20:80 volume ratio, and the second eluate is named as DCMPbL6,7D2.

[0038] Preferably, the DCMPbL6,7D2 is further chromatographed with a methanol/water/acetic acid mixture in a 35:65:1 volume ratio for obtaining a third eluate named as DCMPbL6,7D2H2.

[0039] Preferably, wherein the mobile phase is an isopropanol/water mixture in a 30:70 volume ratio, and the second eluate is named as DCMPbL6,7D3.

[0040] Preferably, the DCMPbL6,7D3 is further chromatographed with a methanol/water/acetic acid mixture in a 40:60:1 volume ratio for obtaining a fourth eluate named as DCMPbL6,7D3H3.

[0041] Preferably, the mobile phase is an isopropanol/water mixture in a 40:60 volume ratio, and the second eluate is named as DCMPbL6,7D4.

[0042] Preferably, the DCMPbL6,7D4 is chromatographed with a methanol/water/acetic acid mixture in a 45:55:1 volume ratio for obtaining a fifth eluate named as DCMPbL6,7D4H3.

[0043] In accordance with another aspect of the present invention, an extract obtained according to the process described above is provided.

[0044] In accordance with another aspect of the present invention, a physiological active composition including a physiologically acceptable carrier for carrying therewith, and one of an extract according to the process described above and an isomer of the extract is provided.

[0045] Preferably, wherein the physiological active composition is a pharmaceutical composition.

[0046] Preferably, the physiologically acceptable carrier is a pharmaceutical carrier.

[0047] In accordance with another aspect of the present invention, an eluate being the second eluate obtained according to the process described above is provided.

[0048] In accordance with another aspect of the present invention, a physiological active composition including a physiologically acceptable carrier for carrying therewith, and one of the eluate being the second eluate described above and the isomer of the eluate is provided.

[0049] Preferably, the physiological active composition is a pharmaceutical composition.

[0050] Preferably, the physiologically acceptable carrier is a pharmaceutical carrier.

[0051] In accordance with another aspect of the present invention, another eluate being the third eluate according to the process described above is provided.

[0052] In accordance with another aspect of the present invention, a physiological active composition including a physiologically acceptable carrier for carrying therewith, and one of the eluate being the third eluate described above and the isomer of the extract is provided.

[0053] Preferably, the physiological active composition is a pharmaceutical composition.

[0054] Preferably, the physiologically acceptable carrier is a pharmaceutical carrier.

[0055] In accordance with another aspect of the present invention, an eluate being the fourth eluate according to the process described above is provided.

[0056] In accordance with another aspect of the present invention, a physiological active composition including a physiologically acceptable carrier for carrying therewith, and the eluate being the fourth eluate and the isomer of the eluate is provided.

[0057] Preferably, the physiological active composition is a pharmaceutical composition.

[0058] Preferably, the physiologically acceptable carrier is a pharmaceutical carrier.

[0059] In accordance with another aspect of the present invention, an eluate being the fifth eluate according to the process described above is provided.

[0060] In accordance with another aspect of the present invention, a physiological active composition including a physiologically acceptable carrier for carrying therewith, and one of an eluate according to the fifth elute and the isomer of the eluate is provided.

[0061] Preferably, the physiological active composition is a pharmaceutical composition.

[0062] Preferably, the physiologically acceptable carrier is a pharmaceutical carrier.

[0063] In accordance with another aspect of the present invention, a process for preparing an extract from a plant is provided. The process includes steps of a) obtaining a first organic extract from the plant, b) extracting the first organic extract by a water and a second organic solvent simultaneously for obtaining a first water layer and a second organic extract, c) extracting the first water layer by a third organic solvent for obtaining a third organic extract and a second water layer, and d) extracting the second water layer by a four organic solvent for obtaining a fourth organic extract and a third water layer.

[0064] Preferably, the plant is an orchid.

[0065] Preferably, the step a) further includes steps of a1) providing a dry material of the plant, a2) grinding the dry material by a pulverizer, and a3) extracting the ground dry material by the first organic solvent for obtaining the first alcohol extract.

[0066] Preferably, the first organic solvent is an alcohol having 1 to 8 carbon atoms.

[0067] Preferably, the second organic solvent is an alkane having 1 to 8 carbons.

[0068] Preferably, the third organic solvent is an ester.

[0069] Preferably, the fourth organic solvent is an alcohol having 1 to 8 carbon atoms.

[0070] In accordance with another aspect of the present invention, a substance defined by the following Figs. 5 to 11 is provided.

[0071] In accordance with another aspect of the present invention, a physiological active composition including a physiologically acceptable carrier for carrying therewith, and one of a substance according to Figs. 5 to 11 and an isomer of the substance.

[0072] Preferably, the physiological active composition is a pharmaceutical composition.

[0073] Preferably, wherein the physiologically acceptable carrier is a pharmaceutical carrier.

[0074] In accordance with another aspect of the present invention, a substance defined by the following Figs. 13 to 17 is provided.

[0075] In accordance with another aspect of the present invention, a physiological active composition including a physiologically acceptable carrier for carrying therewith, and one of a substance according to Figs. 13 to 17 and an isomer of the substance is provided.

[0076] Preferably, the physiological active composition is a pharmaceutical composition.

[0077] Preferably, the physiologically acceptable carrier is a pharmaceutical carrier.

[0078] In accordance with another aspect of the present invention, a substance defined by the following Figs. 19 to 24 is provided.

[0079] In accordance with another aspect of the present invention, a physiological active composition including a physiologically acceptable carrier for carrying therewith, and one of a substance according to Figs. 19 to 24 and an isomer of the substance.

[0080] Preferably, the physiological active composition is a pharmaceutical composition.

[0081] Preferably, the physiologically acceptable carrier is a pharmaceutical carrier.

[0082] The above objects and advantages of the present invention will become more readily apparent to those ordinarily skilled in the art after reviewing the following detailed descriptions and accompanying drawings, in which:

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0083] Fig. 1 is the flow chart of separating protocol for *Dendrobii Caulis* extract according to a preferred embodiment of the present invention.;

[0084] Fig.2 is the bar chart illustrating the effects of the methanol extract of *Dendrobii Cauli* on the RPE function phagocytosis according to a preferred embodiment of the present invention;

[0085] Fig. 3 is the bar chart illustrating the effects of the solvent partition extracts of *Dendrobii Cauli* on the phagocytosis of RPE according to a preferred embodiment of the present invention;



[0086] Fig. 4 is the bar chart illustrating the effects of DCMPbL6,7D2H2 on phagocytosis of RPE according to a preferred embodiment of the present invention ;

[0087] Fig. 5 shows the  $^1\text{H}$ -NMR spectrum of DCMPbL6,7D2H2 in the solvents of Methanol- $\text{d}_4$  and DMSO- $\text{d}_6$ , using a 600-MHz instrument according to a preferred embodiment of the present invention;

[0088] Fig. 6 shows the  $^{13}\text{C}$ -NMR spectrum of DCMPbL6,7D2H2 in the solvents of Methanol- $\text{d}_4$  and DMSO- $\text{d}_6$ , using a 600-MHz instrument according to a preferred embodiment of the present invention;

[0089] Fig. 7 shows the DEPT spectrum of DCMPbL6,7D2H2 in the solvents of Methanol- $\text{d}_4$  and DMSO- $\text{d}_6$ , using a 600-MHz instrument according to a preferred embodiment of the present invention;

[0090] Fig. 8 shows the HMQC spectrum of DCMPbL6,7D2H2 in the solvents of Methanol- $\text{d}_4$  and DMSO- $\text{d}_6$ , using a 600-MHz instrument according to a preferred embodiment of the present invention;

[0091] Fig. 9 shows the HMBC spectrum of DCMPbL6,7D2H2 in the solvents of Methanol- $\text{d}_4$  and DMSO- $\text{d}_6$ , using a 600-MHz instrument according to a preferred embodiment of the present invention;

[0092] Fig. 10 shows the  $^1\text{H}$ - $^1\text{H}$  COSY spectrum of DCMPbL6,7D2H2 in the solvents of Methanol- $\text{d}_4$  and DMSO- $\text{d}_6$ , using a 600-MHz instrument according to a preferred embodiment of the present invention;

[0093] Fig. 11 shows the UV spectrometry of DCMPbL6,7D2H2 according to a preferred embodiment of the present invention;

[0094] Fig. 12 is the bar chart illustrating the effects of DCMPbL6,7D3H3 on phagocytosis of RPE according to a preferred embodiment of the present invention;

[0095] Fig. 13 shows the  $^1\text{H}$ -NMR spectrum of DCMPbL6,7D3H3 in the solvent of DMSO- $\text{d}_6$ , using a 500-MHz instrument according to a preferred embodiment of the present invention;

[0096] Fig. 14 shows the  $^{13}\text{C}$ -NMR spectrum of DCMPbL6,7D3H3 in the solvent of DMSO- $\text{d}_6$ , using a 500-MHz instrument according to a preferred embodiment of the present invention;

[0097] Fig. 15 shows the DEPT spectrum of DCMPbL6,7D3H3 in the solvent of DMSO- $\text{d}_6$ , using a 500-MHz instrument according to a preferred embodiment of the present invention;

[0098] Fig. 16 shows the  $^1\text{H}$ - $^1\text{H}$  COSY spectrum of DCMPbL6,7D3H3 in the solvent of DMSO- $\text{d}_6$ , using a 500-MHz instrument according to a preferred embodiment of the present invention;

[0099] Fig. 17 shows the HMBC spectrum of DCMPbL6,7D3H3 in the solvent of DMSO- $\text{d}_6$ , using a 500-MHz instrument according to a preferred embodiment of the present invention;

[00100] Fig. 18 is the bar chart illustrating the effects of DCMPbL6,7D4H3 on phagocytosis of RPE according to a preferred embodiment of the present invention;

[00101] Fig. 19 shows the  $^1\text{H}$ -NMR spectrum of DCMPbL6,7D4H3 in the solvent of DMSO- $\text{d}_6$ , using a 500-MHz instrument according to a preferred embodiment of the present invention;

[00102] Fig. 20 shows the  $^{13}\text{C}$ -NMR spectrum of DCMPbL6,7D4H3 in the solvent of DMSO- $\text{d}_6$ , using a 500-MHz instrument according to a preferred embodiment of the present invention;

[00103] Fig. 21 shows the DEPT spectrum of DCMPbL6,7D4H3 in the solvent of DMSO-d<sub>6</sub>, using a 500-MHz instrument according to a preferred embodiment of the present invention;

[00104] Fig. 22 shows the HMQC spectrum of DCMPbL6,7D4H3 in the solvent of DMSO-d<sub>6</sub>, using a 500-MHz instrument according to a preferred embodiment of the present invention;

[00105] Fig. 23 shows the <sup>1</sup>H-<sup>1</sup>H COSY spectrum of DCMPbL6,7D4H3 in the solvent of DMSO-d<sub>6</sub>, using a 500-MHz instrument according to a preferred embodiment of the present invention;

[00106] Fig. 24 shows the HMBC spectrum of DCMPbL6,7D4H3 in the solvent of DMSO-d<sub>6</sub>, using a 500-MHz instrument according to a preferred embodiment of the present invention;

[00107] Fig. 25 is the bar chart illustrating the effects of the extract of *Dendrobii Cauli* on nitric oxide (NO) productions of RPE according to a preferred embodiment of the present invention;

[00108] Figs. 26 (A) – (B) show the electrophoresis results showing the effect of the extracts of *Dendrobii Caulis* on  $\beta$ -action (A), and HGF (B) levels in RPE according to a preferred embodiment of the present invention;

[00109] Fig. 27 shows the electrophoresis diagram showing the effect of the chemical solvent partition extracts of *Dendrobii Caulis* on HGF mRNA expression of RPE according to a preferred embodiment of the present invention;

[00110] Figs. 28 (A) to (B) show the electrophoresis results of the effect of the extracts of *Dendrobii Caulis* on the expressions of  $\beta$ -actin, and bFGF for normal RPE according to a preferred embodiment of the present invention;

[00111] Figs. 29 (A) to (B) show the indirectly relevant results of the effect of the extracts of *Dendrobii Caulis* on the expressions of VEGF, and TGF- $\beta$  for normal RPE according to a preferred embodiment of the present invention;

[00112] Figs. 30 (A) to (B) show the indirectly relevant results of the effect of the extracts of *Dendrobii Caulis* on the expressions of  $\beta$ -actin, and bFGF for hypoxia RPE according to a preferred embodiment of the present invention; and

[00113] Figs. 31 (A) to (B) show the indirectly relevant results of the effect of the extracts of *Dendrobii Caulis* on the expressions of VEGF, and TGF- $\beta$  for hypoxia RPE according to a preferred embodiment of the present invention;

[00114] Fig. 32 (A) ~ (E) show the electrophoresis results of the proteolytic activity of cultured RPE after being treated with DCM or HGF according to a preferred embodiment of the present invention;

[00115] Fig. 33 shows the relevant results of the proteolytic activity of cultured RPE after being treated with DCM or HGF according to a preferred embodiment of the present invention; and

[00116] Fig. 34 shows the relevant results of the effects of the extracts of *Dendrobii Caulis* on the advanced glycated endproducts concentration in sera of streptozotocin induced diabetic mice according to a preferred embodiment of the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[00117] The present invention will now be described more specifically with reference to the following embodiments.

#### [00118] EXAMPLE I

Culturing of the retinal pigment epithelium.

The fresh bovine eyes are collected from a slaughterhouse within 2-3 hr after slaughtering. The surfaces of the bovine eyes are sterilized with the tincture of iodine, and then are washed with the PBS (phosphate-buffer saline) buffer solution twice. After dissecting the bovine eyes and removing the lens, the vitreous body, and the retina in sequence, the dissected eyes are treated with 0.01% EDTA (ethylene diamine tetra-acetic acid) for 40 min and then 5% trypsin for 15 min. Then, a single RPE can be obtained after slightly pressing the eyes with a tweezers with round tips and pipetting several times. The pipetted solution is placed within the DMEM (Dulbecco's Modified Eagle Media) containing 10% FCS (fetal calf serum), and then is incubated in an incubator with a humidified atmosphere with 5% CO<sub>2</sub> at 37°C. The medium is replaced per 5-6 days till the cells reach the confluency. The cells are subcultured with a medium containing 0.05% trypsin and 0.02% EDTA. The fifth and the sixth generations of the cells are the main objects of the present invention for the bioactivity testing.

#### [00119] EXAMPLE II

Preparation of the rod outer segments (ROS).

Fresh bovine eyes are kept on ice and exposed under a light for 30 min after obtaining from the slaughterhouse. The surfaces of the bovine eyes are sterilized with the tincture of iodine, and then are washed with the Hank's buffer solution twice. After dissecting the bovine eyes and removing the lens, and the vitreous body in sequence, the retina are taken out and cut into pieces and then treated with 20 mM Tris-HCl containing 20% sucrose. After stirred

for 3 hrs at 4°C, the cell solution is filtered with filters of pore size of 300, 220, 110, 74, 53, and 10 mesh respectively. After counting the cell numbers, the cells are aliquoted with a number of  $1 \times 10^8$  ROS cells per column, and the columns are stored in a refrigerator at -20°C.

#### [00120] EXAMPLE III

Preparation of the FITC (fluorescein isothiocyanate) -ROS.

After the stored ROS cell solution is unfrozen and the suspension is removed, the unfrozen cell solution is mixed with 700µl Borate buffer (pH 8.0) containing 10 % sucrose and some FITC powder with a 1/1000 weight of the ROS is added. Then, the cell solution is stirred for 1.5 hrs at 4°C. The uncombined FITC without attached on the ROS is removed by washing with 20 mM Trans-acetate (pH 7.2) containing 20% sucrose. The cell solution is then centrifuged for 10 min at 10000 rpm. The relevant steps described above are repeated several times. Finally, the pellet is dissolved in the DMEM containing 2.5% sucrose.

#### [00121] EXAMPLE IV

Testing the phagocytosis function of RPE.

The content of the RPE is set up at a concentration of  $5 \times 10^4$  cells/ml, and then 200 µl RPE is seeded into 96 well plates. After the cells reach the confluency, the medium is replaced. Then, 20 µl of various testing medicine is added into each well under the condition that the concentration of the fetal bovine serum is ranged from 2% to 5%. After incubating for 48 hrs, 50 µl of  $2 \times 10^7$  FITC-ROS/ml is added into each well, and the culture is incubated for 4 hrs. The supernatant is removed, and the pellet is washed with 2.5% sucrose/PBS for several times. Finally, 100 µl PBS is added, and the cell

number is measured by the Cyto-Fluorometer (Ex filter: 485/20 nm, Em filter 530/25 nm). The detected value is the cell number of the FITC-ROS attached on the RPE surface and the phagocytized FITC-ROS. Each well is added with 5  $\mu$ l FluoroQuench and then is incubated in an incubator for 1 hr. Next, the relevant fluorescence value is measured and is thought as the cell number of the phagocytized FITC-ROS.

#### [00122] EXAMPLE V

An assay for the NO formation of RPE

100  $\mu$ l of the supernatant of the cell solution is mixed with 50  $\mu$ l 2,3-diaminonaphthalene (DAN). After reacting for 10 min at room temperature, the supernatant is added with 25  $\mu$ l 2.8N NaOH for terminating the reaction, and then is tested with the Cyto-Fluorometer 2300 (basic state: 360+40 nm, excited state: 460+40 nm). The measured value can be converted into the corresponding NO concentration via a standard curve obtained from NaNO<sub>2</sub> with known concentration.

#### [00123] EXAMPLE VI

Preparation of the RPE RNA

The RPE is incubated in the 100 mm culture plate ( $1 \times 10^6$  cells in DMEM + 10% FCS). After the cells reach the confluency, the culturing medium is replaced with the DMEM containing 2.5% FCS therein. Next, 0.1  $\mu$ g/ml of the *Dendrobii Caulis* distribution obtained by extracting with several chemical solvates is added. After incubating for 48 hrs, the culturing medium is removed and the cells are washed with ice PBS buffer solution twice. Then, 1 ml/ $10^5 \sim 10^6$  cells of RNazol™B is added, and the cell solution is placed under room temperature for 5 min. The cells are scraped from the culture plate by a scraper, and then are placed into a 1.5 ml centrifuge tube.

After adding the chloroform having 1/10 volume amount of the cell, the cell solution is mixed immediately and placed on the ice for 5 min. The cell solution is centrifuged at 4°C for 15 min at 12000 rpm, and then the upper transparent water layer is removed into another 1.5 ml centrifuge tube. After adding the isopropanol having the same volume amount of the water layer, the solution is mixed immediately and placed on the ice for 5 min. The cell solution is centrifuged at 4°C, for 10 mins at 12000 rpm, and then the supernatant is discarded. The precipitate is washed with 70% ethanol, and then is centrifuged for 8 min at 7500 rpm, at 4°C. After removing the ethanol and drying the precipitate, the dried precipitate is dissolved with excess pure water (mini-Q water) containing 0.1% DEPC. Some solution is quantitated by the OD<sub>260</sub>, and the corresponding purity is determined by the OD<sub>260</sub> /OD<sub>280</sub>. The rest of the solution is stored within 70% ethanol at -20°C.

#### [00124] EXAMPLT VII

The reverse transcription and polymerase chain reaction (RT-PCR) of the RPE growth factor

There are two total RNA samples extracted from different RPE, the experimental set and the control set. In which, the experimental set is treated with the previously mentioned testing medicine. 2.5µg oligo dT is added into the reaction tube containing 5µg of the extracted total RNA. After being incubated for 10 min at 70°C, the reaction solution is placed for another 10 min at room temperature. Then, 1 µl (10 unit) reagents of 10 mM dNTP 2 µl, rRNasin 1 µl, AMV (Avian Myeloblastosis virus) reverse transcriptase and



the reaction buffer solution are added into the reaction solution, which makes the reaction solution with a total volume of 20  $\mu$ l. Next, the solution is reacted at 42°C for 50 min, at 90°C for 5 min, and then placed on the ice for 10 min. The reaction solution is added with 1  $\mu$ l rRNAaseH, and is reacted at 37°C for 30 min. After obtaining cDNA, 5  $\mu$ l of the 2 mM dNTP is added into the reaction tube containing the cDNA obtained from the reverse transcription reaction in which the cDNA has various diluted concentrations. 1  $\mu$ l sense primer and 1  $\mu$ l antisense primer designed according to the desired testing targets, both have the concentration of 0.1  $\mu$ g/ $\mu$ l, are added into the reaction tube. In which, the designed is one selected from a group consisting of the  $\beta$ -actin (for internal control), the HGF primer, the VEGF primer, the bFGF primer, and the TGF- $\beta$  primer. And, the target genes are HGF, VEGF, bFGF, and TGF- $\beta$ . 1  $\mu$ l polymerase (2 unit) and the reaction buffer are added into the reaction solution for making a total volume of 20  $\mu$ l. Then, the polymerase chain reaction is proceeded in the DNA thermal cycler (Perkin-Elmer-Cetus). In which, the reaction conditions for denaturing, annealing, and extension are respectively at 94°C and at 57°C for 1.5 mins, and at 72°C for 2 mins. The PCR running cycles for the  $\beta$ -actin, HGF, VEGF, bFGF, and TGF- $\beta$  are 25, 35, 25, 25, and 25 cycles respectively.

**[00125]** The following are the descriptions of the primers.

1. HGF primers (Gibco, Gaithersburg, MD, USA)

Sense, 21 mer: 5'- GGG ATT CTC AGT ATC CTC ACA -3'

Antisense, 21 mer: 5'- CCT ACA TTT GTT CGT GTT GGA -3'

2. VEGF primer:

Sense, 24 mer: 5'-AGA AAC CCC ACG AAG TGG TGA AGT-3'

Antisense, 24mer: 5'-CGT TTA ACT CAA GCT GCC TCG CCT-3'

3. bFGF primer:

Sense, 19 mer: 5'-CCA AGC GGC TGT ACT GCA A-3'

Antisense, 24 mer: 5'-GAT CAG ATG CTG CCA TTA AGA TCA-3'

4. TGF- $\beta$  primer:

Sense, 24-mer: 5'-CCT GGA CAC CAA CTA CTG CTT CAG-3'

Antisense, 24-mer: 5'-ACG ATC ATG TTG GAC AAC TGC TCC-3'

[00126] EXAMPLE VIII

Preparation of the glycated albumin

(a) Preparation of the bovine glycated albumin

The bovine glycated albumin (fraction V) is diluted with 1 x PBS (pH 7.4) for forming a 1 mM reaction solution. The reaction solution is filtered through the aseptic 0.22  $\mu$ m membrane and is then added with 250 mM glucose which has been filtered through the aseptic 0.22  $\mu$ m membrane. Then, the reaction solution is incubated in the incubator at 37°C for the glycosylation process. After 3 weeks, the excess glucose of the reaction solution is removed by dialysis. The obtained solution is purified by the Cona-Sepharose gel, and then is treated with the following steps of dialyzing, lyophilizing and storing.

[00127] (b) Preparation of the mice glycated albumin.

The mice glycated albumin (fraction V) is diluted with 1 x PBS (pH 7.4) for forming a 100 mg/ml (1.51 mM) reaction solution. The reaction solution is filtered through the aseptic 0.22  $\mu$ m membrane and is then added with 1.8 g/ml (1M) D-glucose, which has been dissolved in the 1 x PBS with a volume ratio 1:1 and filtered through the aseptic 0.22  $\mu$ m membrane. Then, the reaction solution is incubated in the incubator in the dark at 37°C for glycosylation process. After 60 days, the excess glucose of the reaction solution is removed by dialyzing with a dialysis bag. The obtained solution is filtered through the aseptic 0.22  $\mu$ m membrane, and then the solution is respectively aliquoted after the protein concentration is detected. After lyophilizing, the aliquoted reaction solution is stored at -20°C.

#### [00128] EXAMPLE IX

Determination of AGE-BSA by FITC test

100 mg glycated albumin and 1.8 mg FITC are dissolved in 15 ml 0.1M sodium carbonate buffer, pH 9.5. Under dark environment, after being stirred for 5 hours at 25°C, the reaction solution is chromatographed with a HW-55F (1.6 x 100 cm) molecule sieve column, the elution buffer is 5 % n-butanol (v/v), and the chromatographic rate is determined only by gravity. After being dialyzed three times with de-ionized water, and the protein concentration of the obtained solution is detected. Then, the solution is filtered through the aseptic membrane and respectively aliquoted, lyophilized. After the fluorescence of the solution is determined, the equivalent ratio of the solution marked with fluorescence is estimated.

#### [00129] EXAMPLE X

Observation of the degradation of FITC-labeled AGE-BSA by RPE cells.

First, a pre-sterilized cover slide is put into each well of the 24 well culture plate in advance, and then 300  $\mu$ l 0.5% gelatin is coated on the plate for 30 min. Secondly, the coated gelatin is washed by the medium. Then,  $5 \times 10^4$  RPE cells/well are seeded into the 24 well plate and cultured with 10% FCS/DMEM solution, while each well contains 0.7 ml medium therein. After 48 hours, when the well is filled with cells, the culture solution is discarded. After being washed with 0.5 ml medium for three times, 0.5 ml of the FITC-BSA DMEM solution having various concentration, 30 – 300  $\mu$ g/ml, is added. Then, the cells are washed with PBS solution four times for removing the un-phagocytized and combined fluorescence. The cover slide is taken out from the cell and moistened with PBS solution containing 1% FQEB. After being sealed, the cover slide is observed under a fluorescence microscope at once.

#### [00130] EXAMPLE XI

Enhancement of the *Dendrobii Caulis* crude extract for acceleratively degrading the albumin glycosylation of RPE.

$1 \times 10^6$  RPE cells are seeded into the 96-well microplate, containing 10% FCS in DMEM, at 37°C, supplied with 5% CO<sub>2</sub>. After incubation of 48 hrs, five sets of experiment are treated with the *Dendrobii Caulis* crude extract, in which each set of experiment includes two microplates for different treating time. After treating for 36 or 48 hrs, 0.01% EDTA is added into the microplate for harvesting the cells, and then the cells are suspended in the DMEM cell number for counting. Then, the cell solution is centrifuged for 5 min at 1200 rpm, and the cells are suspended back into 10 ml DEME twice. Then, the cell solution is centrifuged again, and is suspended back again with

the 0.7 ml Homogenization buffer (50mM sodium acetate buffer, pH4.5 , 1mM DTT , 0.15M NaCl , 3mM NaN<sub>3</sub>) containing 0.1 % TritonX-100. Then, the cell solution is vibrated by a sonicator for 15 sec, four cycles, for breaking the cell completely. Next, the cell solution is centrifuged at 13000 rpm for 15 mins, vibrated by a sonicator for 15 sec, four cycles, and centrifuged again at 11000 rpm for 15 min. The supernatant is then collected and filtrated under an aseptic condition. The protein concentration is detected. 1000µg/ml AGE-BSA are filtrated under an aseptic condition. After reacting for 0, 6, 12, 24, 48, 72 hrs, the corresponding electrophoresis is proceeded in order to observe the conformation and the degree of the AGE-BSA degradation

#### [00131] EXAMPLE XII

Preparation of the *Dendrobii Caulis* extract and separation of the purified active content thereof.

(a) Preparation of the *Dendrobii Caulis* alcohol extract.

2 kg dry *Dendrobii Caulis* is ground by a pulverizer. Then, the ground material is put into a bottle containing the methanol or ethanol, and immersed overnight. The reaction solution is filtrated by a gas-extracting apparatus for obtaining the filtrate. Then, the filtrate is put back into the bottle for re-concentration, and some amount of methanol or ethanol is added therein for immersing overnight. Filtrate the reaction solution again. The same protocols are repeated for three times. All the filtrates are then collected, and the methanol or ethanol is exhausted completely. The obtained *Dendrobii Caulis* alcohol crude extract is named as DeCaM. (c) Extraction and separation of the *Dendrobii Caulis* purified component.

[00132] Please refer to Fig.1. Fig. 1 is the flow chart of the separating protocol for *Dendrobii Caulis* extract according to a preferred embodiment of the present invention. Three active components are separated from *Dendrobii Caulis*. 1.9 kg *Dendrobii Caulis* is extracted by methanol three times for obtaining the methanol extract of *Dendrobii Caulis*. The methanol extract of *Dendrobii Caulis* is then re-concentrated and completely dried for forming the DCM standard. The dry DCM standard is dissolved in 2 L EtOAc and then partitioned with 2 L water for obtaining an EtOAc layer and a first water layer. The water layer is extracted with 2 L EtOAc two more times. All the EtOAc layers are collected, re-concentrated and completely dried for obtaining the EtOAc extract. The dry EtOAc extract is respectively partitioned three times with 4 L hexane and 2 L methanol for obtaining a hexane layer and a methanol layer. After re-concentrated and dried, the dried hexane layer and methanol layer are named as DCMPe/h standard (Pe/h), and DCMPe/m standard (Pe/m) respectively. In addition, the first water layer is adjusted into 2L volume by adding de-ionized water, and then is partitioned by adding 2 L butanol for obtaining a butanol layer and a second water layer. After re-concentrated and dried the dried butanol layer and the second water layer are named as DCMPb standard (Pb), and DCMPw standard (Pw) respectively. The Pb is extracted by LH20 gel chromatography with a molecule column (2.5x107 cm, mobile phase <methanol:H<sub>2</sub>O=50:50>). After the activity screening, the DCMPbL6,7 samples are obtained. Then, the samples DCMPbL6,7 are extracted by the Diaion SP-20 SS chromatography with y a absorption column (1 x 30 cm). When the mobile phase is isopropanol : H<sub>2</sub>O = 20 : 80, the eluate named as DCMPbL6,7D2 can be obtained. When the mobile phase is isopropanol : H<sub>2</sub>O = 30 : 70, the eluate named as DCMPbL6,7D3 can be

obtained. When the mobile phase is isopropanol : H<sub>2</sub>O = 40 : 60, the eluate named as DCMPbL6,7D4 can be obtained. Then, the DCMPbL6,7D2 is chromatographed by HPLC reverse C18 column (10 x 300 mm) with the mobile phase of methanol : H<sub>2</sub>O : acetic acid = 35:65:1, and the eluate named as DCMPbL6,7D2H2 is obtained. Further, the DCMPbL6,7D3 is chromatographed by HPLC reverse C18 column (10 x 300 mm) with the mobile phase of methanol : H<sub>2</sub>O : acetic acid = 40:60:1, and the eluate named as DCMPbL6,7D3H3 is obtained. Further, the DCMPbL6,7D4 is chromatographed by HPLC reverse C18 column (10 x 300 mm) with the mobile phase of methanol : H<sub>2</sub>O : acetic acid = 45:55:1, and the eluate named as DCMPbL6,7D4H4 is obtained.

[00133] (b) Preparation of the *Dendrobii Caulis* chemical solvent extract.

The DCM (extracts of *Dendrobii Caulis* extracting with methanol) is dissolved in 400 ml de-ionized water, and then 400 ml n-hexane is added. The reaction solution is partitioned for obtaining the n-hexane layer and the first water layer respectively. The related extraction steps are repeated three times. The final n-hexane layer is named as DCMph. The first water layer is then partitioned with the ethyl-acetate four times for obtaining a second water layer and a EtOAc layer. The obtained EtOAc layer is named as DCMPe. Then, the second water layer is partitioned with the n-butanol three times for obtaining an n-butanol layer named as DCMPb and a third water layer named as DCMPw.

[00134] EXAMPLE XIII

Effect of the alcohol extract of *Dendrobii Caulis* on the mice having diabetic angiopathy induced by the glycated albumin.

Four sets of BABLC/c mice, aged 8 weeks, are fed with the forage containing various amount of the methanol extract of *Dendrobii Caulis*, 0 mg/kg/day, 1 g/kg/day, 200 mg/kg/day, 40 mg/kg/day. Each set has three mice. The mice is treated with glycated mice serum albumin (MAG) via the tail vein injection, 2.5 mg/time, twice/week, for three weeks. Then, the mice are continuously fed with the forage containing the methanol extract of *Dendrobii Caulis* for two weeks. The mice are dissected in order to prepare wax-embedded sections of the eyes, liver, and kidney in which the pathological change are observed by the HE stain

#### [00135] EXAMPLE XIV

Effects of the extract and purified component of *Dendrobii Cauli* on RPE function phagocytosis.

Please refer to Fig.2, which is the bar chart illustrating the effects of the methanol extract of *Dendrobii Cauli* on the RPE function phagocytosis. As shown in Fig. 2, it's known that various concentrations (0.1, 1, 10  $\mu\text{g/ml}$ ) of the methanol (DCM) extract of *Dendrobii Cauli* can accelerate the phagocytosis of RPE. The relevant experimental contents are simply described as follows.  $1 \times 10^4$  RPE cells are seeded in 96-well microplate per well, containing 10% FCS in DMEM after 48hrs, and the medium is changed with 2% FCS in DMEM. Then different concentrations of the methanol extract of *Dendrobii Caulis* are added respectively. After 48hrs, 50  $\mu\text{l}$  of  $2 \times 10^7$  FITC-ROS/ml is added into each well. Four hours later, the unbounded FITC-ROS is washed out with PBS. The fluorescence intensity is detected by a 1420 Multilable counter (PE) measurement system. #  $P < 0.05$ , \*  $P < 0.01$  are obtained by comparing with phagocytosis of RPE treated with 2% FCS.



[00136] Please refer to Fig. 3, which is the bar chart illustrating the effects of the solvent partition extracts of *Dendrobii Cauli* on the phagocytosis of RPE. As shown in Fig. 3, it is clear that the DCMPe/m partition and the DCMPb partition can significantly accelerate the phagocytosis of RPE. The relevant experimental contents are simply described as follows.  $1 \times 10^4$  RPE cells are seeded in 96-well microplate per well, containing 10% FCS in DMEM. After 48hrs, the medium is changed with 2% FCS in DMEM and then different concentrations of the extract of *Dendrobii Caulis* (DCMPe/h, DMCPe/m and DCMPb) are added respectively. After 48hrs, 50  $\mu$ l of  $2 \times 10^7$  FITC-ROS/ml is added to each well. Four hours later, the unbounded FITC-ROS is washed out with PBS. The fluorescence intensity is detected by a 1420 Multilable counter (PE) measurement system. #  $P < 0.05$ , \* $P < 0.01$  are obtained by comparing with phagocytosis of RPE treated with 2% FCS.

[00137] Furthermore, the purified components DCMPbL6,7D2H2, DCMPbL6,7D3H3, and DCMPbL6,7D4H3 can significantly accelerate the phagocytosis of RPE. For instance, various concentration (0.1, 1, 10, 100  $\mu$ g/ml) of DCMPbL6,7D2H2 can significantly accelerate the phagocytosis of RPE, and the relevant results are shown in Fig. 4. Please refer to Fig. 4, which is the bar chart illustrating the effects of DCMPbL6,7D2H2 on phagocytosis of RPE. The relevant experimental contents are simply described as follows.  $1 \times 10^4$  RPE cells are seeded in 96-well microplate per well, containing 10% FCS in DMEM. After 48hrs, the medium is changed with 2% FCS in DMEM and then different concentrations of DCMPbL6,7D2H2 are added respectively. After 48hrs, 50  $\mu$ l of  $2 \times 10^7$  FITC-ROS/ml is added into each well. Four hours later, the unbounded FITC-ROS is washed out with PBS. The fluorescence intensity is detected

by a 1420 Multilable counter (PE) measurement system. #  $P < 0.05$ , \*  $P < 0.01$  are obtained by comparing with the phagocytosis of RPE treated with 2% FCS. Although the chemical structure of DCMPbL6,7D2H2 can't be confirmed by the current science yet, the DCMPbL6,7D2H2 is defined by the following NMR spectrums and the UV spectrophotometry. Figs. 5-10 are the various NMR spectrums of DCMPbL6,7D2H2 in the solvents of Methanol- $d_4$  and DMSO- $d_6$ , using a 600-MHz instrument. And, Fig. 11 is the UV spectrometry of DCMPbL6,7D2H2.

[00138] As to the purified component DCMPbL6,7D3H3, various concentration (0.1, 1  $\mu\text{g/ml}$ ) of DCMPbL6,7D3H3 can significantly accelerate the phagocytosis of RPE, and the relevant results are shown in Fig. 12. Please refer to Fig. 12, which is the bar chart illustrating the effects of DCMPbL6,7D3H3 on phagocytosis of RPE. The relevant experimental contents are simply described as follows.  $1 \times 10^4$  RPE cells are seeded in 96-well microplate per well, containing 10% FCS in DMEM. After 48hrs, the medium is changed with 2% FCS in DMEM and then different concentrations of DCMPbL6,7D3H3 are added respectively. After 48hrs, 50  $\mu\text{l}$  of  $2 \times 10^7$  FITC-ROS/ml is added into each well. Four hours later, the unbounded FITC-ROS is washed out with PBS. The fluorescence intensity is detected by a 1420 Multilable counter (PE) measurement system. \*  $P < 0.01$  is obtained by comparing with the phagocytosis of RPE treated with 2% FCS. Although the chemical structure of DCMPbL6,7D3H3 can't be confirmed by the current science yet, the DCMPbL6,7D3H3 is defined by the following NMR spectrums. Figs. 13-17 are the various NMR spectrums of DCMPbL6,7D3H3 in the solvent of DMSO- $d_6$ , using a 500-MHz instrument.

[00139] As to the purified component DCMPbL6,7D4H3, various concentration (0.1, 1, 10  $\mu\text{g/ml}$ ) of DCMPbL6,7D4H3 can significantly accelerate the phagocytosis of RPE, and the relevant results are shown in Fig. 18. Please refer to Fig. 18, which is the bar chart illustrating the effects of DCMPbL6,7D4H3 on phagocytosis of RPE. The relevant experimental contents are simply described as follows.  $1 \times 10^4$  RPE cells are seeded in 96-well microplate per well, containing 10% FCS in DMEM. After 48hrs, the medium is changed with 2% FCS in DMEM and then different concentrations of DCMPbL6,7D4H3 are added respectively. After 48hrs, 50  $\mu\text{l}$  of  $2 \times 10^7$  FITC-ROS/ml is added into each well. Four hours later, the unbounded FITC-ROS is washed out with PBS. The fluorescence intensity is detected by a 1420 Multilable counter (PE) measurement system. \*  $P < 0.01$  is obtained by comparing with the phagocytosis of RPE treated with 2% FCS. Although the chemical structure of DCMPbL6,7D4H3 can't be confirmed by the current science yet, the DCMPbL6,7D3H3 is able to be defined by the following NMR spectrums. Figs. 19-24 are the various NMR spectrums of DCMPbL6,7D4H3 in the solvent of DMSO- $\text{d}_6$ , using a 500-MHz instrument.

#### [00140] EXAMPLE XV

Effects of the extract of *Dendrobii Cauli* on the NO production of RPE.

Please refer to Fig. 25, which is the bar chart illustrating the effects of the extract of *Dendrobii Cauli* on nitric oxide (NO) productions of RPE. The methanol extract of *Dendrobii Caulis* (DCM) having various concentration (100, or 1000  $\mu\text{g/ml}$ ) can significantly accelerate the NO production of RPE, and the relevant results are shown in Fig. 25. The EtOAc extract of *Dendrobii Caulis* (DCMPe) having various concentration (10, or 100, or 1000  $\mu\text{g/ml}$ ) can significantly accelerate the NO production of RPE, and the relevant

results are shown in Fig. 25. The n-butanol extract of *Dendrobii Caulis* (DCMPE) having various concentration (10, or 1000  $\mu\text{g/ml}$ ) can significantly accelerate the NO production of RPE, and the relevant results are shown in Fig. 25. The relevant experimental contents are simply described as follows.  $1 \times 10^4$  RPE cells are seeded in 96-well microplate per well, containing 10% FCS in DMEM. After 48hrs, the medium is changed with 2% FCS in DMEM then different concentrations of the extracts of *Dendrobii Caulis* are added respectively. After 48hrs, 50  $\mu\text{l}$  of  $2 \times 10^7$  FITC-ROS/ml is added into each well. Four hours later, the unbounded FITC-ROS is washed with PBS. The fluorescence intensity is detected by a 1420 Multilable counter (PE) measurement system. \*  $P < 0.05$  is obtained by comparing with the NO production of RPE treated with 2% FCS

#### [00141] EXAMPLE XVI

Effects of extracts of *Dendrobii Caulis* on  $\beta$ -actin and HGF level in RPE cell lysates.

Please refer to Figs. 26 (A) – (B), which are the electrophoresis results of showing the effect the extracts of *Dendrobii Caulis* on  $\beta$ -action (A), and HGF (B) levels in RPE cell. The expression level is shown by cDNA quantity, in which the cDNA is obtained from RPE cell lysates via RT-PCR steps. The relevant experimental contents are simply described as follows. Confluent RPE cells are shifted to DMEM with 2% FCS and 1000  $\mu\text{g/ml}$  of extracts of *Dendrobii Caulis* for 24 hrs. cDNA is generated from 1  $\mu\text{g}$  total RNA as a template (1X). Lane 1:  $\phi$  X174/Hae III marker, Lane 2: 1X template, Lane 3: 2X dilution of template, Lane 4: 4X dilution of template,

Lane 5 8X dilution of template, Lane 6 16X dilution of template. As shown in Fig. 26, the methanol extract of *Dendrobii Caulis* (DCM) can significantly accelerate the expression of HGF, since the RPE cells treated with the extracts of *Dendrobii Caulis* have stronger HGF cDNA expression level.

[00142] Please refer to Fig. 27, which is the electrophoresis diagram showing the effect of the chemical solvent partition extracts of *Dendrobii Caulis* on HGF mRNA expression of RPE. The experimental steps are similar to that of Fig. 2b. As shown in Fig. 27, the n-hexane extract of *Dendrobii Caulis* (Ph) can significantly accelerate the expression of HGF, since the RPE cells treated with Ph clearly shows a stronger HGF cDNA expression level.

#### [00143] EXAMPLE XVII

Effects of extracts of *Dendrobii Caulis* on bFGF, VEGF, and TGF- $\beta$  inhibitions of a normal RPE and a hypoxia RPE.

The extracts of *Dendrobii Caulis* having an effective concentration are added into RPE. After incubated for 48 hrs, the RNA is extracted from the cell lysate, and then the template cDNA is formed from the RNA by RT-PCR. The concentration of the template cDNA is two times and the following results are indirectly quantitated according to this concentration. Please refer to Figs. 28 (A) to 29 (B), which are the relevant results of the extracts of *Dendrobii Caulis* on the expressions of  $\beta$ -actin, bFGF, VEGF, and TGF- $\beta$  for normal RPE. In which, the result of  $\beta$ -actin is a control set. Figs. 28 (A) and (B) are the electrophoresis results of the effect of the extracts of *Dendrobii Caulis* on the expressions of (A)  $\beta$ -actin and (B) bFGF. The cDNA generated from

the mRNA of the normal RPE by using 1  $\mu$ g of total RNA as a template (1X). The results shown in pictures descriptions are: Lane 1:  $\phi$  X174 marker, Lane 2: 100bp ladder marker, Lane 3: 1X template, Lane 4: 2X dilution of template, Lane 5: 4X dilution of template, Lane 6: 8X dilution of template, Lane 7: 16X dilution of template, and Lane 8: 32X dilution of template. Figs. 29 (A) and (B) are the electrophoresis result of the effect of the extracts of *Dendrobii Caulis* on the expressions of VEGF (A) and TGF- $\beta$  (B). The cDNA is generated from the mRNA of the normal RPE by using 1  $\mu$ g of total RNA as a template (1X). The relevant results shown in pictures are: Lane 1:  $\phi$  X174 marker, Lane 2: 100bp ladder marker, Lane 3: 1X template, Lane 4: 2X dilution of template, Lane 5: 4X dilution of template, Lane 6: 8X dilution of template, Lane 7: 16X dilution of template, and Lane 8: 32X dilution of template. As shown in Figs 28 - 29, for a normal RPE, the extracts of *Dendrobii Caulis* inhibit the expression of the bFGF mRNA to 25% and the expression of the VEGF mRNA to 50%. However, the extracts of *Dendrobii Caulis* have no influence on the expression of the TGF- $\beta$  mRNA.

[00144] Please refer to Figs. 30 (A) to 31 (B), which are the electrophoresis results of the effects of the extracts of *Dendrobii Caulis* on the expressions of  $\beta$ -actin, bFGF, VEGF, and TGF- $\beta$  for hypoxia RPE. In which, the results of  $\beta$ -actin are control set. Figs. 30 (A) and (B) are the electrophoresis result of the extracts of effect of the *Dendrobii Caulis* on the expressions of (A)  $\beta$ -actin and (B) bFGF. The cDNA is generated from the

mRNA of the hypoxia RPE by using 1  $\mu$ g of total RNA as a template (1X). The relevant results shown in pictures are: Lane 1:  $\phi$  X174 marker, Lane 2: 100bp ladder marker, Lane 3: 1X template, Lane 4: 2X dilution of template, Lane 5: 4X dilution of template, Lane 6: 8X dilution of template, Lane 7: 16X dilution of template, and Lane 8: 32X dilution of template. Figs. 31 (A) and (B) are the electrophoresis results of the extracts of the effect of *Dendrobii Caulis* on the expressions of VEGF (A) and TGF- $\beta$  (B). The cDNA is generated from the mRNA of the hypoxia RPE by using 1  $\mu$ g of total RNA as a template (1X). The relevant results shown in pictures are: Lane 1:  $\phi$  X174 marker, Lane 2: 100bp ladder marker, Lane 3: 1X template, Lane 4: 2X dilution of template, Lane 5: 4X dilution of template, Lane 6: 8X dilution of template, Lane 7: 16X dilution of template, and Lane 8: 32X dilution of template. As shown in Figs 30 - 31, for a hypoxia RPE, the extracts of *Dendrobii Caulis* inhibit the expression of the bFGF mRNA to 50%, the expression of the VEGF mRNA to 50%, and the expression of the TGF- $\beta$  mRNA to 25%. Obviously, the extracts of *Dendrobii Caulis* have different inhibitory effects on the growth factors when the RPE cells are under normal or hypoxia environment. In other words, the extracts of *Dendrobii Caulis* selectively regulate the expressions of the genes, such as bFGF, VEGF, TGF- $\beta$ , which all play important roles in the ophthalmic defects.

#### [00145] EXPERIMENT XVIII

Preparation of AGE-BSA in vitro

A BSA (bovine serum albumin, fraction V) solution having the concentration of 0.1 g/ml is prepared by dissolving appropriate amount of BSA into 1 x PBS solution. A glucose solution having the concentration of 180 mg/ml glucose is prepared by dissolving appropriate amount of glucose into a 1 x PBS solution. After being filtered through the aseptic 0.22  $\mu$ m membrane, 5 ml of the BSA solution and 5 ml of the glucose solution are both added into a 15 ml test tube, while the reaction concentrations for BSA and glucose are respectively 760 mM and 0.5 M. Then, the reaction solution is sealed up and incubated in the incubator in the dark at 37°C. And, the control experiment is prepared without adding glucose. After incubated for 2, 4, 8, 12, 16 weeks, the reaction solution is dialyzed four times with the de-ionized water having a volume of 100 times of the reaction solution for removing the glucose. Then, the obtained solution is filtered under an aseptic condition, lyophilized, and weighted for determining the contents and redissolved. After being respectively aliquoted and lyophilized, the aliquoted reaction solution is stored at -20°C.

#### [00146] EXPERIMENT XIX

The change of AGE-BSA degradation ability of the RPE cell treated with the extracts of *Dendrobii Caulis* and HGF.

$1 \times 10^6$  RPE cells are seeded into the 96-well microplate, containing 10% FCS in DMEM, at 37°C, supplied with 5% CO<sub>2</sub>. After incubation of 48 hrs, five sets of experiment are respectively treated with the *Dendrobii Caulis* crude extract and HGF, in which each set of experiment includes two microplates for different treating time. After treating for 36 or 48 hrs, 0.01% EDTA is added into the microplate for harvesting the cells, and then the cells



are suspended in the DMEM and the cell number is counted. Then, the cell solution is centrifuged for 5 min at 1200 rpm, and the cells are suspended back into 10 ml DME twice. Then, the cell solution is centrifuged again, and is suspended back again in the 0.7 ml Homogenization buffer (50mM sodium acetate buffer, pH4.5, 1mM DTT, 0.15M NaCl, 3mM NaN<sub>3</sub>) containing 0.1 % TritonX-100. Then, the cell solution is vibrated by a sonicator for 15 sec, four cycles, so as to break the cell completely. Next, the cell solution is centrifuged at 13000 rpm for 15 mins, vibrated by a sonicator for 15 sec, four cycles, and centrifuged again at 11000 rpm for 15 min. The supernatant is then collected and filtrated under an aseptic condition. The protein concentration is detected. 1000µg/ml AGE-BSA are filtrated under an aseptic condition. After reacting for 0, 6, 12, 24, 48, 72 hrs, the corresponding electrophoresis is proceeded in order to observe the conformation and the degree of the AGE-BSA degradation.

#### [00147] EXPERIMENT XX

Effects of the methanol extracts of *Dendrobii Caulis* (DCM) and hepatocyte growth factor on the RPE cell proteolysis activity.

After being treated with the methanol extracts of *Dendrobii Caulis* (DCM) or HGF and incubated for 36 hrs, the extracted cellular extracts will be proceeded with the following experiments with all fractions. The cellular extracts are reacted with AGE-BSA by adding AGE-BSA having the same amount as that of the cellular extracts. That's to say, the ratio of the enzyme to the substrate is 1:1, and both concentrations of the cellular extracts and the AGE-BSA are controlled at 500 µg/ml. It's known that the proteolysis activities of different treatments are not obviously different (not shown), and

the reaction rates are relatively high during the incubation period of 12 to 48 hrs. Further, the proteolysis activities of different treatments are a little bit different (not shown) during the incubation period of 48 to 72 hrs.

[00148] Please refer to Fig. 32. Fig. 32 shows the electrophoresis results of the effects of DCM or HGF for the proteolytic activities of the cultured RPE cell. The activities are assayed by different incubation time with AGE-BSA. The different symbols represent different treatments: (a) DCM 100  $\mu\text{g/ml}$ , (b) DCM 10  $\mu\text{g/ml}$ , (c) DCM 1  $\mu\text{g/ml}$ , (d) 50ng/ml HGF and (e) without treated DCM or HGF as control. RPE cells ( $1 \times 10^6$  cells/petri dish) are cultured in DMEM with 10% FCS for 48hr. After reaching 90% confluence, RPE cells are incubated with various concentrations of DCM in 2% FCS or 50ng/ml HGF for 48 hours. Cellular extracts (shown as lane 2 on each gel) were incubated with AGE for 0 to 82 hours (from lane 3 to 8). And, AGE is incubated alone as negative control (lane 9, 10). In addition, please refer to Fig. 33. Fig. 33 shows the proteolytic activity of cultured RPE cell after being treated with DCM or HGF. In which, the proteolytic activity on each time point is showed as index comparing with the start time of incubation. The mount of residual BSA or AGE-BSA are quantitated by ImageQuant software and drawn as degradation curve. As Fig. 32 shows, the proteolytic activities caused by treating with 10  $\mu\text{g/ml}$  DCM and 50 ng/ml HGF are a little bit greater than that of the control set. And, as shown in Fig. 33, the amount of AGE-BSA will be obviously decreased by being treated with 10  $\mu\text{g/ml}$  DCM, 100  $\mu\text{g/ml}$  DCM, and 50 ng/ml HGF. In which, the influence of 10  $\mu\text{g/ml}$  DCM is the greatest. Therefore, it's known that proper amount of DCM or HGF will have influence on the proteolytic activity of the RPE cell.

[00149]      EXPERIMENT XVIII

Effects of extracts of *Dendrobii Caulis* on the advanced glycated endproduct concentration in sera of streptozotocin induced diabetic mice.

C57BL/6J male mice, aged 6 weeks, are continuously treated with the streptozotocin (STZ) at the dose of 50 mg/kg/day by injecting 0.15M citric acid buffer, pH 4.5, IP for five days. After further 12 to 14 days, the blood sugars of the mice are tested by the orbital blood sampling method. The mice with blood sugar concentration higher than 250 mg/dl are collected, and then are divided into four sets for the following experiments. The four sets of mice are respectively fed with the forage containing various amount of the methanol extract of *Dendrobii Caulis*, 0 mg /kg/day, 1 g/kg/day, 200 mg /kg/day, and 40 mg/kg/day. Then, the blood sugars of the mice are sampled and tested once per week. If the blood sugars of the mice are decreased, the mice needed to be injected with STZ 200 mg/kg/day for keeping the blood sugars of the mice high. After 4 to 8 weeks, the sera of the mice are sampled and the blood sugars and AGE AB contained therein are tested. Further, the eyes, liver, and the kidney of the mice are sampled and treated with HE stain, and then treated with paraffin to form paraffin embedding sections. The weights of the mice, and the consumptions of water and forage are recorded during the experiment. And, the appearance of the fur and the circulations of limbs and the tail are observed and photographed for recording.

[00150]      Please refer to Fig.34. Fig. 34 shows the advanced glycated endproduct concentrations in sera of the Streptozotocin (STZ) induced diabetic mice. In which, the sera are respectively obtained from diabetic mice and the age-matched control mice, 10 weeks after the STZ administration. Values are respective the means STD of 5 independent experiments ( \*P, 0.05 , \*\*

p<0.001 vs the control group). The relevant results show that the methanol extract of *Dendrobii Caulis* can significantly reduce the AGE formation in the Streptozotocin (STD) induced diabetic mice. Therefore, it appears that the methanol extracts of *Dendrobii Caulis* is curative for the diabetic complication induced by AGE.

[00151] While the invention has been described in terms of what is presently considered to be the most practical and preferred embodiments, it is to be understood that the invention needs not be limited to the disclosed embodiment. On the contrary, it is intended to cover various modifications and similar arrangements included within the spirit and scope of the appended claims which are to be accorded with the broadest interpretation so as to encompass all such modifications and similar structures.